Teachers' Professional Development in Free Software for Education in Taiwan

Jui-Chen Yu, Hung-Jen Yang, Lung-Hsing Kuo, and Hsieh-Hua Yang

Abstract: **-**
The purpose of this study was to identify the status of promoting teachers to use free software as educational resource. In this information age, using computer software to support learning had become a reality. On campus, teachers lead our students to learn. Teachers' knowledge of applying computer software in education initiates and leads next generations of using information technology. There is a need to understand how education system helps teachers to learn up to date information about educational software. An investigation method was applied in this study. The population of this study was 7540 from 2002 to July, 2011. 343 courses were sampled for reaching 95% confidence and 5% confidence interval. By applying statistical tests, investigation results were revealed. Based upon statistical results, conclusions of research problems were reached. The increasing frequency of promoting courses is identified. The life cycle of courses offered for learning about free software is also concluded.

Key-Words: - Professional Development, Free Software, Educational Software

I. Introduction

Teachers play the core role of leading education. In this information age, teacher is giving a high priority to the use of ICT for more equitable and pluralistic development in education, so learner could expand the knowledge base about the issues. As UNESCO listed[1], the broad questions of ICT in education are:

- How can one use ICT to accelerate progress towards education for all and throughout life?
- How can ICT bring about a better balance between equity and excellence in education?
- How can ICT help reconcile universality and local specificity of knowledge? and
- How can education prepare individuals and society to benefit from ICT that increasingly permeate all realms of life?

Hardware and software are both important parts of ICT in education[2]. The curriculum also play a guidance role[3]. Teachers are required appropriate skill in using ICT in education[4].

Software determines the possible usage and foundation of instructional context, teaching strategy, learning procedure and functions. Choosing and Owing software become an important job while using ICT in education[5-7].

There is a need to understand how education system helps teachers to learn up to date information about educational software. The purpose of this study was to identify the status of promoting teachers to use free software as educational resource. In this information age, using computer software to support learning had become a reality. On campus, teachers lead our students to learn. Teachers' knowledge of applying computer software in education initiates and leads next generations of using information technology. The role of teacher to apply ICT in education is shown in Figure 1.

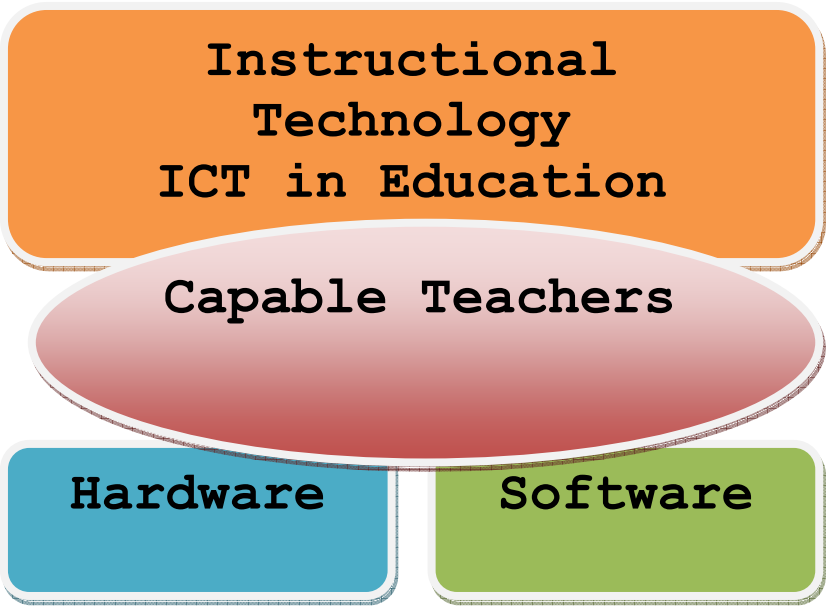

Fig. 1 Teachers' role in applying ICT in Education

II. 2 Problem Formulation

Free software initiate a new era for teachers to use ICT in education. There are advantages for education to apply free software in education. The concepts of free software are required to be introduced to educational professionals.

For preparing our teachers' skill of using ICT in education, in-service education would be the answer to the problem. Through in-service courses, it is possible to improve teachers' recognition about free software.

A. Educational Software

The utilize of computer hardware and software in education and training dates to the early 1940s, when American researchers developed flight simulators which used analog computers to create simulated onboard instrument data. One such system was the type19 synthetic radar trainer, built in 1943. From these early attempts in the WWII era through the mid 1970s, educational software was straight tied to the hardware, usually mainframe computers, on which it ran. Pioneering educational computer systems in this era built-in the PLATO system (1960), developed at the University of Illinois, and TICCIT (1969)[8]. In 1963, IBM had established a partnership with Stanford University's Institute for Mathematical Studies in the Social Sciences (IMSSS), directed by Patrick Suppes, to develop the first comprehensive CAI elementary school curriculum which was implemented on a large scale in schools in both California and Mississippi. In 1967 Computer Curriculum Corporation (CCC, now Pearson Education Technologies) was formed to market to schools the materials developed through the IBM partnership. Early terminals that ran educational systems cost over $10,000, putting them out of reach of most institutions. Some programming languages from this period, particularly BASIC (1963), and LOGO (1967) can also be considered educational, as they were specifically targeted to students and novice computer users. The PLATO IV system, released in 1972, supported many features which later became standard in educational software running on home computers. Its features included bitmap graphics, primitive sound generation, and support for non-keyboard input devices, including the touch-screen [9-10].

The arrival of the personal computer, with the Altair 8800 in 1975, changed the field of software in general, with specific implications for educational software. Whereas users prior to 1975 were dependent upon university or government owned mainframe computers with timesharing, users after this shift could create and use software for computers in homes and schools, computers available for less than $2000. By the early 1980s, the availability of personal computers including the Apple II (1977), Commodore PET (1977), Commodore VIC-20 (1980), and Commodore 64 (1982) allowed for the creation of companies and nonprofits which specialized in educational software. Broderbund and The Learning Company are key companies from this period, and MECC, the Minnesota Educational Computing Consortium, a key non-profit software developer. These and other companies designed a range of titles for personal computers, with the bulk of the software initially developed for the Apple II.[11]

Major developments in educational software in the early and mid 1990s were made possible by advances in computer hardware. Multimedia graphics and sound were increasingly used in educational programs. CD-ROMs became the preferred method for content delivery. With the spread of the internet in the second half of the 1990s, new methods of educational software delivery appeared. In the history of virtual learning environments, the 1990s were a time of growth for educational software systems, primarily due to the advent of the affordable computer and of the Internet. Today Higher Education institutions use virtual learning environments like Blackboard Inc. to provide greater accessibility to learners. Major types of educational software are listed in the following[12].

1. Children's learning and home learning
2. Courseware
3. Classroom aids
4. Assessment software
5. Edutainment
6. Reference software
7. Custom Platform
8. Computer games with learning value
9. Software in corporate training and tertiary education
10. Software for specific educational purposes[13]

B Free Software

In the 1950s, 1960s, and 1970s, it was normal for computer users to have the software freedoms associated with free software. Software was commonly shared by individuals who used computers and by hardware manufacturers who welcomed the fact that people were making software that made their hardware useful. Organizations of users and suppliers, for example, SHARE, were formed to facilitate exchange of software. By the late 1960s, the picture changed: software costs were dramatically increasing, a growing software industry was competing with the hardware manufacturer's bundled software products (free in that the cost was included in the hardware cost), leased machines required software support while providing no revenue for software, and some customers able to better meet their own needs did not want the costs of "free" software bundled with hardware product costs.

The economic viability of free software has been recognized by large corporations such as IBM, Red Hat, and Sun Microsystems. Many companies whose core business is not in the IT sector choose free software for their Internet information and sales sites, due to the lower initial capital investment and ability to freely customize the application packages. Also, some non-software

industries are beginning to use techniques similar to those used in free software development for their research and development process; scientists, for example, are looking towards more open development processes, and hardware such as microchips are beginning to be developed with specifications released under copyleft licenses (see the OpenCores project, for instance). Creative Commons and the free culture movement have also been largely influenced by the free software movement.

In the late 1990s, other groups published their own definitions which describe an almost identical set of software. The most notable are Debian Free Software Guidelines published in 1997, and the Open Source Definition, published in 1998.

The BSD-based operating systems, such as FreeBSD, OpenBSD, and NetBSD, do not have their own formal definitions of free software. Users of these systems generally find the same set of software to be acceptable, but sometimes see copyleft as restrictive. They generally advocate permissive free software licenses, which allow others to use the software as they wish, without being legally forced to provide the source code. Their view is that this permissive approach is more free. The Kerberos, X11, and Apache software licenses are substantially similar in intent and implementation.

C. Teacher Education

Teacher education refers to the policies and procedures designed to equip prospective teachers with the knowledge, attitudes, behaviors and skills they require to perform their tasks effectively in the classroom, school and wider community.

Although ideally it should be conceived of, and organized as, a seamless continuum, teacher education is often divided into three stages:

- Pre-service/ initial teacher training / education (a pre-service course before entering the classroom as a fully responsible teacher);
- induction (the process of providing training and support during the first few years of teaching or the first year in a particular school);
- teacher development or continuing professional development (an in-service process for practicing teachers)

D. In-service teacher education

Because the world that teachers are preparing young people to enter is changing so rapidly, and because the teaching skills required are evolving likewise, no initial course of teacher education can be sufficient to prepare a teacher for a career of 30 or 40 years. Continuous Professional Development (CPD) is the process by which teachers (like other professionals) reflect upon their competences[14-15], maintain them up to date, and develop them further.

The extent to which education authorities support this process varies, as does the effectiveness of the different approaches. A growing research base suggests that to be most effective, CPD activities should[16-18]:

- be spread over time
- be collaborative
- use active learning
- be delivered to groups of teachers
- include periods of practice, coaching, and follow-up
- promote reflective practice
- encourage experimentation, and respond to teachers' needs.

III Problem Solution

In this session, the research methodology, tool, and statistical analysis are reported first. The findings are also presented after methodological information.

A. Methodology

An investigation research method was applied to collect data for exploring the status of introducing free software to teachers. A systematical random sample procedure was conducted to randomly select information from the National In-service Teacher Information Web side in Taiwan, R.O.C.

In the information web service, there are total 7540 course records from year 2002 to July, 2011 as the research population. For this study, total 343 course records were randomly selected and collected for analysis.

B. Research Tools

The investigated record worked as the research tool in this study. The record structure is listed as followings.

1. Name of the course
2. Course category
3. Date
4. Content
5. Target group
6. Credit hours

Since the data is from the course provider and each course is under the supervising of district education authority, this tool and data collected are effective.

C. Statistical Analysis

Frequency count and cross table with the chi-square test are used for analyzing data. The hypothesis was defined for testing.

Hypothesis 1
The number of courses offered in each year reveals no significant difference.
Hypothesis 2
The number of courses offered in each month reveals no significant difference.
Hypothesis 3
There is no significant difference for courses offered among target groups.
Hypothesis 4
There is no significant difference for courses offered among time slots.

Based upon the theory frame, four hypotheses were set for statistical test. The test result of the first hypothesis would provide the answer about whether the amount of free software courses offered each year is at the same level. If not, what is the status of changes?

The second hypothesis test would identify whether courses distributed among months were even. If not, what is the status of courses distribution?

The third hypothesis test would identify whether courses provided to different groups were even. If not, what is the status of each group?

The fourth hypothesis test would identify whether the courses occurred in different time slots were even. If not, what is the status of each time slot?

D. Findings

The research findings are presented in two parts: descriptive information and hypothesis test information.

D.1. Descriptive Statistics

According to those 343 records collected from National Teachers' In-service Education Information Web Side, free software course frequencies of each year were listed in Table 1. The data is from 2003 till July 2011. Since 2003 to 2005, the number is one digit.

In the year 2008, the total free software courses are 73 and increasing 350% from 22 in year 2007. For the year 2011, only half year has passed. The record number of year 2011 is only part of that year.

Table 1 Free Software courses frequency among years

year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2003	3	.9	9	.9
	2004	4	1.2	1.2	2.0
	2005	5	1.5	1.5	3.5
	2006	27	7.9	7.9	11.4
	2007	22	6.4	6.4	17.8
	2008	73	21.3	21.3	39.1
	2009	83	24.2	24.2	63.3
	2010	103	30.0	30.0	93.3
	2011	23	6.7	6.7	100.0
	Total	343	100.0	100.0	

Based upon months of a year, the distribution of free software courses offered are listed in table 3. There are two lower month, Feb. and Aug.. There are also two higher moths, March and Nov.

Table 2 Free Software courses frequency among month

month

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	14	4.1	4.1	4.1
	2	7	2.0	2.1	6.2
	3	35	10.2	10.3	16.4
	4	35	10.2	10.3	26.7
	5	22	6.4	6.5	33.1
	6	20	5.8	5.9	39.0
	7	13	3.8	3.8	42.8
	8	5	1.5	1.5	44.3
	9	19	5.5	5.6	49.9
	10	48	14.0	14.1	63.9
	11	63	18.4	18.5	82.4
	12	60	17.5	17.6	100.0
	Total	341	99.4	100.0	
Missing	System	2	.6		
Total		343	100.0		

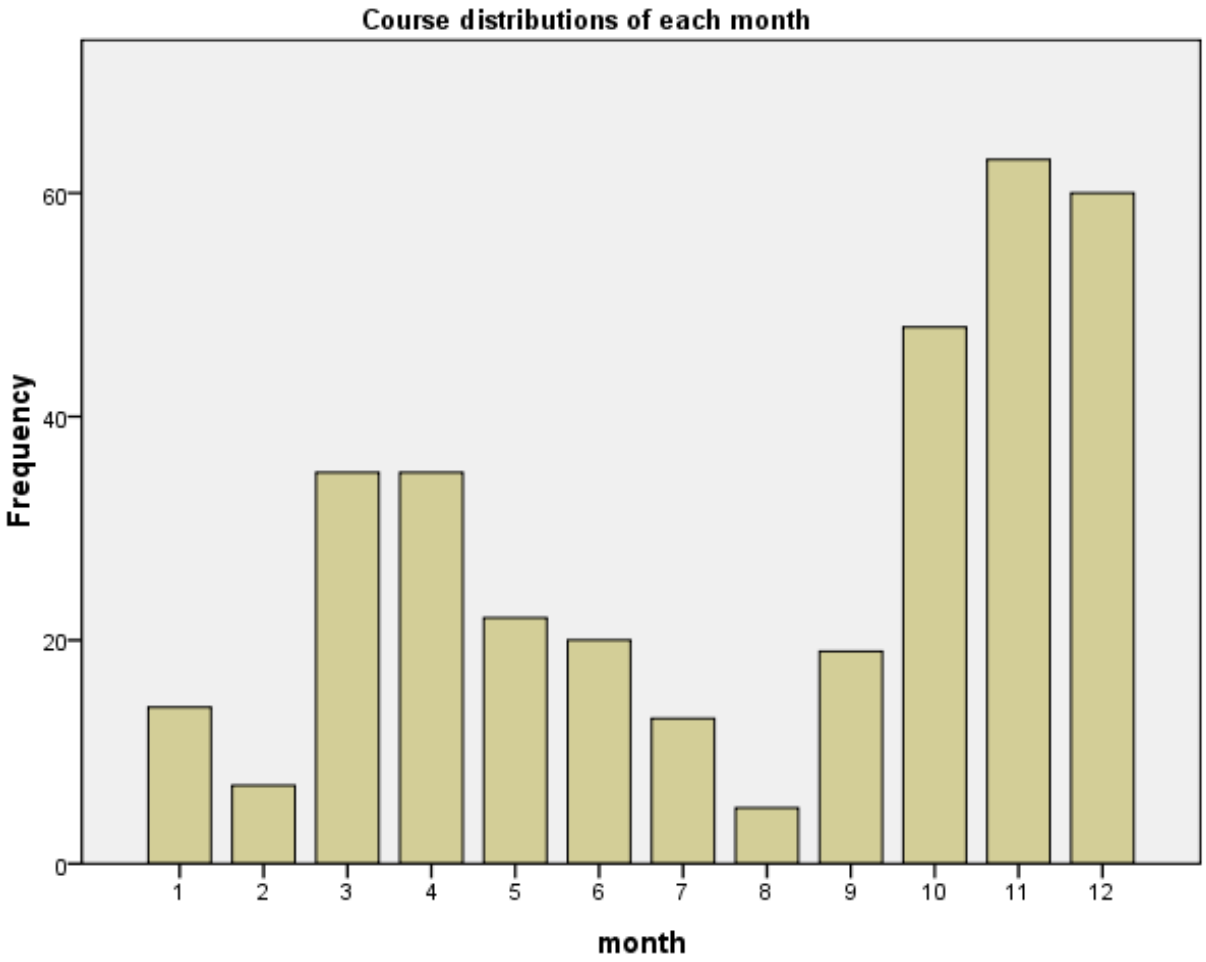

Fig. 2 Free Software Course amounts by month

The distribution in figure 2 shows the trend of double cycle in a year. The first cycle start with February and end with July. The second cycle starts with August and end with January. Both cycle times are six months.

In Table 3, the free software course distribution is listed according to the timeslot. For the weekday, there are 257 courses provided. For the private time slot, only third of weekday courses provided. The total courses are 86.

Table 3 Free Software courses frequency by timeslots

timeslots

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Private time	86	25.1	25.1	25.1
	Weekday	257	74.9	74.9	100.0
	Total	343	100.0	100.0	

Table 4 Free Software courses frequency by class types

Class types

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	In School	159	46.4	46.4	46.4
	Cross Schools	184	53.6	53.6	100.0
	Total	343	100.0	100.0	

In Table 4, the free software course distribution is listed according to the class types. There are two types of class. The first type is only provided for hosted school teachers. The second type is provided for any school teachers. The first type course amount is 159. The second type course amount is 184.

In Table 5, the free software course distribution is listed according to credit hours. The highest frequency credit hour is three. There are 78.7 % courses with three

credit hours.

Less than 10 % courses provide more than 7 credit hours for free software in-service education.

Table 5 Free Software courses frequency by credit hours

Credit Hours

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	11	3.2	3.2	3.2
2	43	12.5	12.5	15.7
3	216	63.0	63.0	78.7
3.5	1	.3	.3	79.0
4	6	1.7	1.7	80.8
5	1	.3	.3	81.0
6	27	7.9	7.9	88.9
7	3	.9	.9	89.8
8	3	.9	.9	90.7
9	3	.9	.9	91.5
12	21	6.1	6.1	97.7
14	4	1.2	1.2	98.8
18	1	.3	.3	99.1
20	1	.3	.3	99.4
24	1	.3	.3	99.7
36	1	.3	.3	100.0
Total	343	100.0	100.0	

D.2. Hypothesis Tests

In this session, the test results are presented according to all four hypotheses.

Hypothesis 1

The number of courses offered in each year reveals no significant difference.

Based upon the test result in Table 6, it is concluded that free software courses are significantly not evenly distributed within each year.

Table 6 Chi-square test of free software courses by years

Year

	Observed N	Expected N	Residual
2003	1	37.9	-36.9
2004	4	37.9	-33.9
2005	5	37.9	-32.9
2006	27	37.9	-10.9
2007	22	37.9	-15.9
2008	73	37.9	35.1
2009	83	37.9	45.1
2010	103	37.9	65.1
2011	23	37.9	-14.9
Total	341		

Test Statistics

	year
Chi-Square	3.086E2
df	8
Asymp. Sig.	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 37.9.

Hypothesis 2
The number of courses offered in each month reveals no significant difference.

Table 7 Chi-square test of free software courses by monthes

month

	Observed N	Expected N	Residual
1	14	28.4	-14.4
2	7	28.4	-21.4
3	35	28.4	6.6
4	35	28.4	6.6
5	22	28.4	-6.4
6	20	28.4	-8.4
7	13	28.4	-15.4
8	5	28.4	-23.4
9	19	28.4	-9.4
10	48	28.4	19.6
11	63	28.4	34.6
12	60	28.4	31.6
Total	341		

Test Statistics

	month
Chi-Square	1.519E2
df	11
Asymp. Sig.	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 28.4.

The significant level, 0, is less than 0.05. Based upon the test result in Table 7, it is concluded that free software courses are not evenly distributed within each month.

Hypothesis 3
There is no significant difference for courses offered among target groups.

Table 8 Chi-square test of free software courses by class types

Class types

	Observed N	Expected N	Residual
0	159	171.5	-12.5
5	184	171.5	12.5
Total	343		

Test Statistics

	Class type
Chi-Square	1.822[a]
df	1
Asymp. Sig.	.177

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 171.5.

Hypothesis 4
There is no significant difference for courses offered among time slots.

Table 9 Chi-square test of free software courses by timeslots

timeslot

	Observed N	Expected N	Residual
Private time	86	171.5	-85.5
Weekday	257	171.5	85.5
Total	343		

Test Statistics

	timeslot
Chi-Square	85.251[a]
df	1
Asymp. Sig.	.000

a. 0 cells (.0%) have expected frequencies less than 5.
The minimum expected cell frequency is 171.5.

IV Conclusion

According to research findings, conclusions are presented in this section. The purpose of this study was to identify the status of enhancing teachers' recognition of free software in education through in-service education courses.

1. Based the course distribution, it is concluded that the promoting efforts are increasing each year.
2. Based the course distribution, it is concluded that there exists time cycle of promoting free software learning. There are two cycles each year and the cycle duration are six month.
3. Based the course distribution, it is concluded that the class types of in-school and cross school is even.
4. Based the course distribution, it is concluded that teachers take more courses offered in weekday more than courses offered in private time.

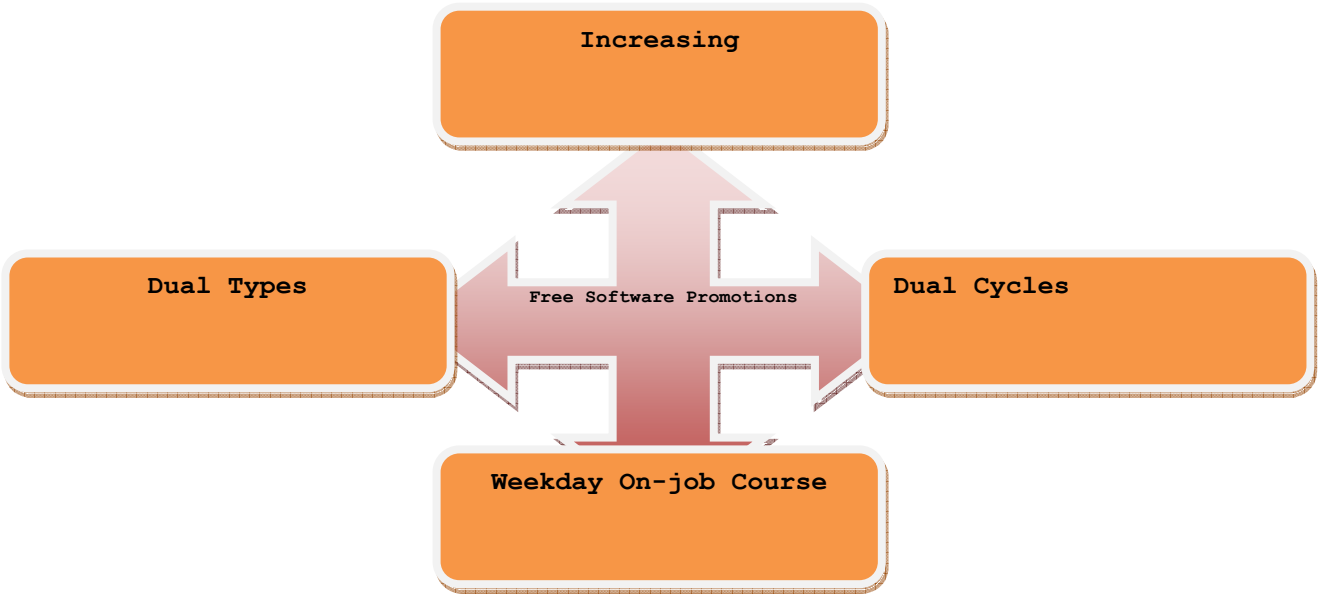

Fig. 3 Free Software in-service education promotion

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Jui-Chen Yu obtained a Master of Science in Technology Education from University of North Dakota and a Ph.D.in Industrial Technology Education from Iowa State University. She is a senior researcher at National Science and Technology Museum. Her research interests include all aspects of both museum education and technology education.

Hung-Jen Yang obtained a Master (M.S.) in Technology Education from University of North Dakota and a Ph.D. in Industrial Technology Education from Iowa State University. He is currently conducting research on knowledge transfer, and knowledge reuse via information technology. His research has appeared in a variety of journals including those published by the WSEAS.

Lung-Hsing Kuo received his Master (M.E.) in Education (1990~1993) and Ph.D. in Education from (1993~1997) National Kaohsiung Normal University. He is the director of the center for teacher career and professional development in National Kaohsiung Normal University. His research interests include social Science Research Methodology, Continuing Education, Human and social, Youth Study, Emotion development and management, Counseling and Education Issues.

Hsieh-Hua Yang received her Master (M.S.) in Health Promotion and Health Education from National Taiwan Normal University and Ph.D. in Health Policy and Management from National Taiwan University. She is a professor in Health Care Administration at Oriental Institute of Technology. Her research focuses are health behavior, social network and organizational behavior.